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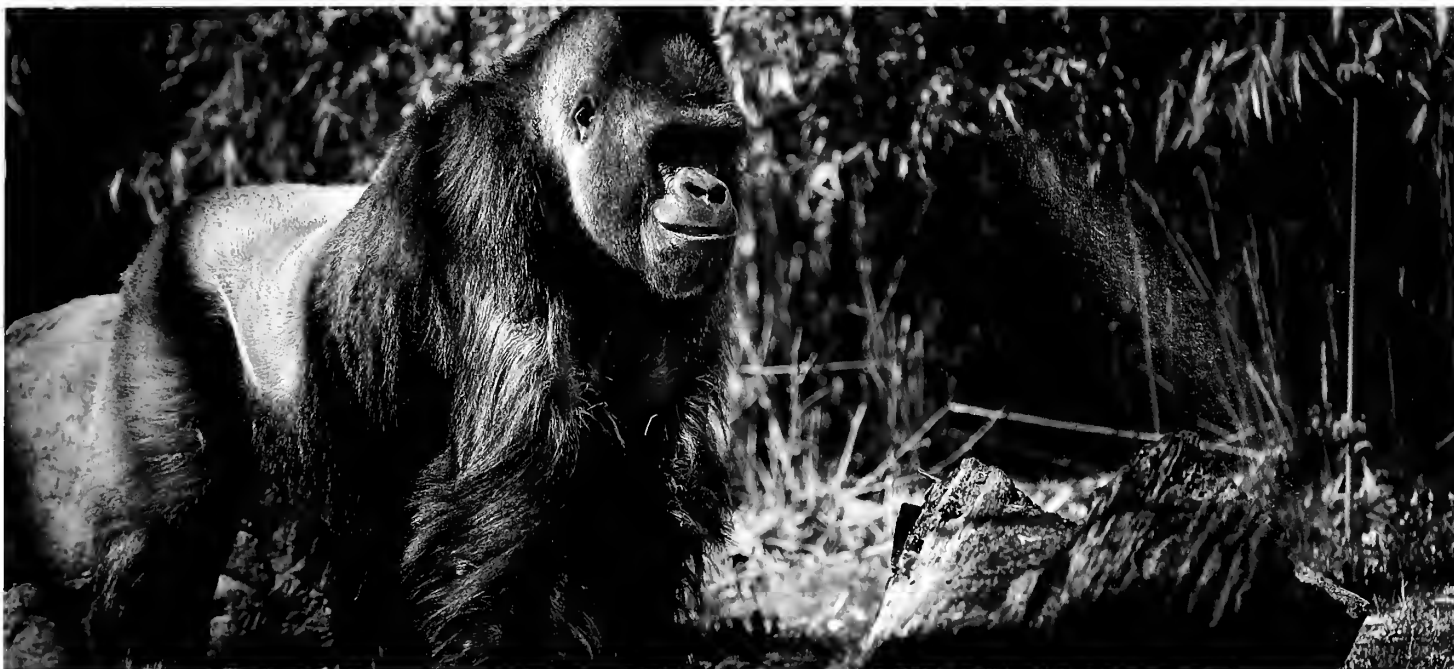


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## MISSION STATEMENT

American Association of Zoo Keepers, Inc.

The American Association of Zoo Keepers, Inc. exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

## About the Cover

This month's cover features a blue spotted grouper (*Cephalopholis argus*) at Denver Zoo's Tropical Discovery. The photograph was taken by Ashley Arimborgo of Cheyenne Mountain Zoo. The blue spotted grouper is found predominately from the Red Sea to South Africa, and as far east as Australia. They are the most widely distributed of the groupers. They are commonly associated with reef front habitats and prefer shallower depths to deep reef habitat. Males live in harem groups of females and the size of their territory is dependent upon their size. They are threatened by over-fishing but are still abundant throughout the ocean.

This issue of the *AKF* includes a "first" for the journal, and some innovations in the industry as well. We are excited to have the first species of fish grace the cover of our journal since we have reformatted the *AKF*. Inside the issue, the Cleveland Metroparks Zoo reports how staff were the first to detect a cardiac arrhythmia in an awake gorilla through voluntary cardiac ultrasounds. Change and innovation are the theme of this month's Letter from the President, and this month's collection of featured articles and columns represent some classic examples of how AAZK members are leaders in our profession of animal care.

Articles sent to *Animal Keepers' Forum* will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for *AKF*. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. Phone (330) 483-1104; FAX (330) 483-1444; e-mail is [shane.good@aaazk.org](mailto:shane.good@aaazk.org). If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: [aaazk.org/akf-submission-guidelines/](http://aaazk.org/akf-submission-guidelines/).

Deadline for each regular issue is the 3rd of the preceding month. Dedicated issues may have separate deadline dates and will be noted by the Editor.

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*“Innovation  
distinguishes  
between a  
leader and  
a follower.”*

— Steve Jobs

I grew up in an environment of constant change. As the son of a U.S. Marine, I was transplanted all over the world. I never lived in the same house for more than four years and was always challenged with new environments and new companions. For me, change was a constant; an acceptable lifestyle that evoked thoughts of endless possibilities. I not only accepted change in my life, I adapted to it. Over the years, it has helped to shape the way I look at life: an endless stream of possibilities.

In our profession, we endure a great number of changes. The same can be said about our Association. For some, change takes on a negative connotation that evokes frustration and negativity. In my 21 years as an animal care professional, I have found that the people with whom I place the greatest admiration have been effective leaders of change; the common denominator being that those who were effective leaders of change didn't just accept change, they adapted to it, embraced it, and reshaped their own way of thinking as a result of it. Some of the most successful innovators of change were those who quickly adapted and did so not with blind acceptance but rather with a critical eye.

I once had a boss who constantly challenged me to always have a plan. It was intimidating at times, knowing in my own mind what I wanted to accomplish but having to articulate my process when questioned. I have learned over time that the process is just as valuable as the end result. In fact, the process allows for evaluation and critical thought during the planning stages.

We are effective leaders of change. We do so in many ways in our profession, whether shaping behaviors or changing environments for our animals through enrichment. It is a simple fact that providing changes to our animals' environment is what we do on a constant basis. We are promoters of change, embracing the concept that providing the best care for our animals often requires that we insert some element of change into their lives. Ideally, we do this with planning, evaluation, and reassessment. In other words, the best evoked change for our animals comes with a plan.

Be the innovators of change in the lives of your animals. Do not accept status quo as the norm for your animals' environment. Question, challenge, assess and evaluate and most importantly have a plan and be ready to defend it. Your transparency will provide opportunities for growth and perfection.

Change for the sake of change is never good but change that has vision and planning is not only ideal, it promotes an opportunity for that change to become the norm.

As always, I welcome your thoughts and input. E-mail me at [bob.cisneros@aaazk.org](mailto:bob.cisneros@aaazk.org); I would love to hear from you. Drop me a line and I promise to write back.

Respectfully,

*Bob Cisneros*

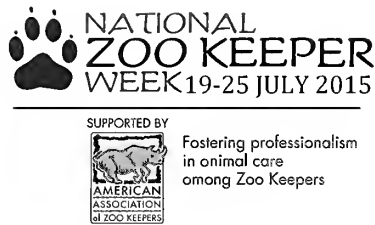


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# COMING EVENTS

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**August 6-9, 2015**  
**13<sup>th</sup> Annual Symposium**  
**on the Conservation and**  
**Biology of Tortoises and**  
**Freshwater Turtles**  
Tucson, AZ  
For more information go to:  
[turtlesurvival.org/conference](http://turtlesurvival.org/conference)

**August 27-30, 2015**  
**AZADV REGIONAL**  
**CONFERENCE**  
Nashville, TN  
Hosted by Nashville Zoo  
For more information visit:  
[nashvillezoo.org/azadv2015](http://nashvillezoo.org/azadv2015)

**September 9-13, 2015**  
**International Congress**  
**on Zookeeping**  
Leipzig, Germany  
Hosted by Leipzig Zoo and  
the International Congress of  
Zookeepers (ICZ).  
For more information visit:  
[iczoo.org](http://iczoo.org).

**September 17-21, 2015**  
**AZA National Conference**  
Salt Lake City, UT  
Hosted by Utah's Hogle Zoo  
For more information visit:  
[aza.org](http://aza.org).

**October 5-9, 2015**  
**Giraffe Care Workshop**  
Colorado Springs, CO  
Hosted by Cheyenne  
Mountain Zoo  
For more information visit:  
[cmzoo.org/index.php/giraffe-care-workshop/](http://cmzoo.org/index.php/giraffe-care-workshop/)

**October 11-15, 2015**  
**Orangutan SSP Husbandry**  
**Workshop**  
Wichita, KS  
Hosted by Sedgwick County Zoo  
For more information visit:  
[scz.org/visitor\\_tickets-conferences.php](http://scz.org/visitor_tickets-conferences.php)

**October 12-16**  
**Zoos and Aquariums**  
**Committing to Conservation**  
**Conference (ZACC)**  
Denver, CO  
Hosted by Denver Zoo  
For more information go to:  
<http://www.denverzoo.org/ZACC>

**October 29-November 1, 2015**  
**Advancing Bear Care - 2015**  
Hanoi, Viet Nam  
Hosted by Bear Care Group  
For more information visit:  
[bearcaregroup.org/#!/abc-2015-vietnam/c227f](http://bearcaregroup.org/#!/abc-2015-vietnam/c227f)



**September 27 - Oct. 1, 2015**  
**AAZK National Conference**  
St. Louis, MO  
Hosted by Saint Louis Zoo and  
St. Louis Chapter of AAZK  
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at: [www.stlzoo.org/animals/soyouwanttobeazookeeper/americanassociationofzooke/](http://www.stlzoo.org/animals/soyouwanttobeazookeeper/americanassociationofzooke/)

**November 6-8, 2015**  
**Southeast Regional**  
**Gorilla Workshop**  
Tampa, FL  
Hosted by Busch Gardens  
Tampa.  
For more information contact:  
[keri.bauer@buschgardens.com](mailto:keri.bauer@buschgardens.com)





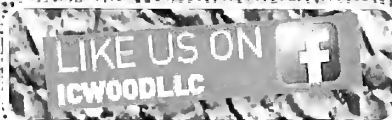
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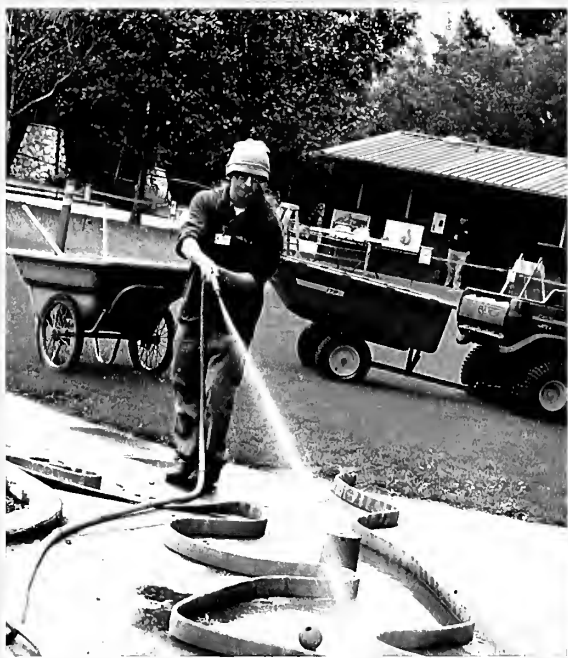
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Please NOTE, this helps offset the increasingly costly fees of running the BFR program. There are now various ways the public is able to donate to your Bowling For Rhinos events online. These convenient ways come with a price tag! Some of the online sources have a 10% fee! The AAZK online donation button only comes with a 2.5% fee.

In order for AAZK's BFR to be able to keep it's bragging rights of continuing to boast that "100% of all donations go to conservation", AAZK now covers these fees that are being taken out of each online donation. This means it is EXTREMELY important that we collect the \$25 from every Chapter in order to maintain the ability to pay these fees.

Please, when possible, encourage folks to donate by check.

Also, PLEASE do NOT use the AAZK online donation button to make your Chapter's contribution to BFR. PLEASE continue to write a check so that your donation does not cost the Association additional fees. The AAZK online donation button is meant to be used by the public only.

We are one of the ONLY organizations that can say "100% of every penny you donate goes directly to conservation" so you get the biggest bang for your buck! We are proud of this fact and we hope you are too. But we need your help to maintain this bragging right.

Thanks for your help!

Patty Pearthree, National BFR Program Manager  
919-678-0449, [Patty.Pearthree@aazk.org](mailto:Patty.Pearthree@aazk.org)



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# Identification and Treatment of a Cardiac Arrhythmia in a Western Lowland Gorilla (*Gorilla gorilla gorilla*)

Elena Hoellein Less, PhD, Associate Curator of Animals

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Pam Dennis, PhD, DVM, Veterinary Epidemiologist

Julie Good, Lead Animal Keeper

Rose Sharp, Animal Keeper

Terri Rhyner, Animal Keeper

Joan Cramer, Echocardiology Technician

Tad Schoffner, Curator of Animals

Cleveland Metroparks Zoo, Cleveland, OH

## Abstract

Bebac is a 30-year-old Western Lowland Gorilla (*Gorilla gorilla gorilla*) that currently resides at Cleveland Metroparks Zoo in a bachelor troop with another 27-year-old male, Mokolo. Both gorillas were diagnosed with cardiac disease in 2008. They were trained to allow heart rates to be detected voluntarily with the use of a Doppler heart rate monitor (Sonoline®) in 2011 and subsequently for voluntary cardiac ultrasounds in 2012 (see [www.GAHP.com](http://www.GAHP.com) for ultrasound information). In December 2014, Bebac had a significant episode of illness, during which he was depressed, lethargic, and inappetent. As part of the evaluation of this illness, an awake cardiac ultrasound was conducted and a cardiac arrhythmia was detected. This arrhythmia was able to be detected and treated early based on solid keeper observation skills and a team effort of gorilla training. This was the first time someone has been able to identify an arrhythmia in an awake gorilla and document it through voluntary ultrasound efforts. Previous to this, cardiac arrhythmias had only been detected in awake gorillas via the use of implantable cardiac monitors. To date, Bebac is still being monitored for this condition with regular ultrasounds, heart rate monitoring, and team discussions on his condition.

## Introduction

Cleveland Metroparks Zoo (CMZ) currently houses 2.0 western lowland gorillas. Bebac (30-years-old) and Mokolo (27-years-old) are related males that were born at the Lincoln

Park Zoo and have been housed at Cleveland Metroparks Zoo since 1994. Mokolo has been the dominant male since the passing of the third male in the bachelor troop, Brooks, in 2005. Brooks was diagnosed with fibrosing cardiomyopathy at the time of necropsy.

In 2007, a diet study was initiated at CMZ to better understand and potentially improve our gorilla diets. The gorillas were first started on a high fiber diet that included a resistant starch supplement. Resistant starch is different from simple starches in that it functions much like an insoluble fiber and is fermented in the hind gut. This supplement lowered insulin and cholesterol levels significantly in both gorillas. In 2009, the gorillas were placed on a high fiber, low dietary starch diet (the biscuit-free diet). This diet involved the removal of biscuits and increased the amount of fresh greens the gorillas were getting daily by four times. Alfalfa and flax seed were added daily as well. Although the resistant starch was responsible for the large decrease in insulin and cholesterol levels, the biscuit-free diet lowered these parameters even more. Most notably, on this new diet, the gorillas were able to increase time spent feeding to 60% (from 25%) and an abnormal behavior that was frequently performed, regurgitation and reingestion, was eliminated. Additionally, switching to this diet improved the overall body condition and appearance of both gorillas.

In 2008, prior to beginning the biscuit-free







Elena Hoellein Less, PhD, Associate Curator of Animals  
Michael Selig, DVM, Associate Veterinarian  
Pam Dennis, PhD, DVM, Veterinary Epidemiologist  
Julie Good, Lead Animal Keeper  
Rose Sharp, Animal Keeper  
Terri Rhyner, Animal Keeper  
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Tad Schoffner, Curator of Animals  
Cleveland Metroparks Zoo, Cleveland, OH

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In 2008, prior to beginning the biscuit-free

diet, the gorillas were scale trained. This was essential in monitoring their health in general as well as monitoring the effects of this diet. The scale was placed in a hallway so that the gorillas had to pass by it on their way to their exhibit from their holding area. Both animals were trained to station on the scale. Mokolo picked the behavior up rather quickly, but it took Bebac approximately 10 months to become desensitized to the scale. This behavior was crucial to the diet change and is a tool still used in their health management. We currently obtain weights multiple times a week in managing the gorillas.

The gorillas were both diagnosed with cardiac disease in 2008 when they had their first echocardiogram while anesthetized for a health examination. At this time the gorillas were both started on doses of carvedilol and lisinopril to help manage the cardiac disease identified at their health exams. Bebac was thought to have more advanced disease and was also started on the diuretic furosemide. Both gorillas were evaluated again under anesthesia in 2009 and 2011 and after some medication tweaking in 2009, were found to have stabilized by 2011. In 2011, the furosemide for Bebac was discontinued due to the significant stabilization that had been seen in his condition since 2008. Since 2011, and prior to the detection of the arrhythmia in Bebac, both gorillas have been on maintenance doses of carvedilol and lisinopril.

In an effort to try to noninvasively monitor their heart conditions, a training program was initiated in 2011. The gorillas were first trained for heart rate measurements using a Sonoline Fetal Doppler® heart rate monitor. Based on these heart rate measurements, parameters of normal heart rate were set for both gorillas. Bebac has a naturally lower heart rate (range between 54-74 bpm) than Mokolo

(60-80 bpm). In 2012, a cardiac arrhythmia of a few skipped beats was noted for Bebac only. At this time, Bebac showed no clinical signs associated with the arrhythmia so the decision was made to monitor it. During subsequent heart rate monitoring, the arrhythmia was not consistently detected after its initial detection by keepers. Heart rates were collected on the gorillas on a weekly basis for monitoring.

In 2012, the keeper staff began training the gorillas for voluntary cardiac ultrasound. It took approximately a year to get the gorillas used to the ultrasound gel and to hold for the ultrasound probe. Fortunately, one of CMZ's docents was a retired human cardiac ultrasound technician. She began attending the training sessions to help direct keepers on placement of the cardiac ultrasound probe and to detect any changes in the gorillas' hearts. Since 2012, we had not seen the arrhythmia. The cardiac ultrasound has been very helpful at allowing veterinary staff to monitor CMZ's gorillas' hearts in a non-invasive way.

### Cardiac Arrhythmia Event

Upon closing the gorilla area at approximately 5:15 PM on 16 December 2014, Bebac was behaving abnormally when his keeper went to give him his medications. Bebac was slow to approach the keeper for his medication. He then went down on one elbow and slowly rolled over onto his back. The keeper observed the muscles on his chest clenching repeatedly. Although still awake, he did not respond to his keeper when she called to him and made no attempts to get up. Additional keepers were called to the scene. At this point, he was partially sitting up and attempting to steady himself. The keepers observed two more bouts of chest clenching. The clenching seemed to start at the outside edge of his chest and grow with intensity until the chest was completely

clenched. The bouts of chest tightening lasted 10-20 seconds each. After the three observed bouts, he seemed to relax. He picked at some food, but was not very interested. When his keeper tried to get a heart rate on him, he refused to participate. He began making his nest for the night and laid down. The vet staff was alerted, but the group had decided that if he settled in for the night and no additional chest clenching was observed, that Bebac would be left alone for the evening.

The Associate Curator (AC) over the area arrived around 6:45 PM and sat with Bebac. He seemed relaxed and ready to settle down for the night. Around 7:30 PM, right before the AC was considering leaving for the evening, Bebac sat up again and had another bout of chest clenching. This one was more prolonged, ~30 seconds. It appeared similar to the other bouts in that the tightening began on the periphery of the chest and moved inward. The clenching did not appear to be as strong as it did in previous bouts. At this point, the AC called the vet and the curator over the area to come in. The gorillas were on exhibit for an event in the building, but due to this latest bout of chest clenching, the decision was made to shift them down to their holding area. Bebac was reluctant to move down into holding. Mokolo went over to Bebac and gently nudged him down into holding, following close behind.

When the veterinarian arrived, a clenching of the chest was not observed, but Bebac looked extremely lethargic and was holding onto the mesh for support. The veterinarian observed Bebac and then discussed with the group what they had observed. He explained there could be a number of different health issues (heart disease, the flu, pneumonia, kidney disease, etc.) that could be responsible for his current symptoms. It was mentioned earlier in the day

Cleveland Metroparks Zoo staff performing a cardiac ultrasound on 1.0 Gorilla Bebac



A small window was created in the holding mesh to allow for proper manipulation of the ultrasound wand.



that the keeper had heard a number of skipped beats while attempting to get the weekly heart rate from this individual. Given this information and the clinical signs, his heart condition was the primary concern. His initial thought was that if he was having a cardiac episode resulting in pulmonary edema, fluid within the lungs, a diuretic like furosemide (Lasix) would be the best treatment. While retrieving the furosemide, our veterinarian spoke with a cardiologist with the Great Ape Heart Project, Dr. Ilana Kutinsky, who confirmed that it sounded like a diuretic would be appropriate to try.

### Management of the Cardiac Arrhythmia

The following day a voluntary cardiac ultrasound was performed. It was immediately evident that Bebac was having a significant problem with his heart as there were 3-4 abnormal beats per 30 second period. Prior to this event, keepers had periodically heard abnormal beats when determining the heart rate, but they never had been noted with the ultrasound or with any frequency that they were thought to be of any concern. Dr. Kutinsky characterized these heart beats as premature ventricular beats or extra, abnormal heartbeats that begin in one of the heart's ventricles. These premature beats are followed by a compensatory pause. Although Bebac's clinical signs of lethargy and chest clenching had diminished, he was still much more lethargic and had a reduced appetite compared to what is normal for him. With continued treatment with the furosemide (and the addition of a magnesium supplement to further support his heart health), Bebac improved each day until his heart rhythm appeared to be nearly back to its condition prior to this recent arrhythmia. His heart could be listened to for a minute at a time and only 0-1 missed beats were heard.

Once Bebac's heart had stabilized with this treatment, staff moved from doing nearly daily ultrasounds to a protocol of doing twice weekly cardiac ultrasounds. This would keep Bebac from getting tired of too frequent ultrasounds, but allow staff to keep a close eye on Bebac's heart. Keepers also continued to get daily heart rates and would immediately alert vet staff if 2-4 missed beats in a minute were heard.

More recently on 5 Jan 2015, Bebac became stressed while seeing veterinary staff in the building dealing with an ailing howler monkey. Another clenching of his chest was observed, although not as strong as the initial arrhythmia observed the month prior. Ultrasounds were conducted the next morning and the missed beats per minute had picked back up again. They were not as frequent as what was observed in December, but had increased from where they were in recent weeks. With this, it was decided to put him on an additional diuretic, spironolactone, which would work in conjunction

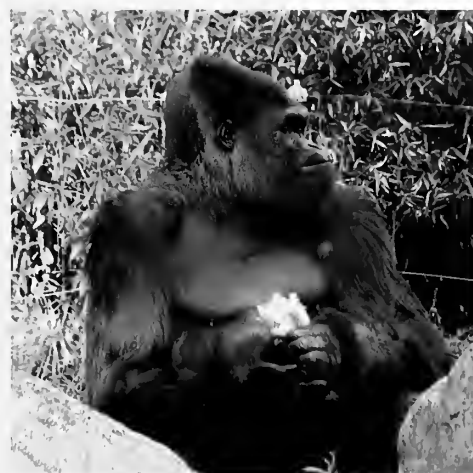
with the furosemide. Cardiac ultrasounds were increased to approximately four times a week until the condition had stabilized.


### Follow-Up

In the weeks following these events, voluntary cardiac ultrasounds were reduced to 2x a week. Keepers still monitor heart rate on a daily basis. Bebac's body condition had always looked its best within a weight range of 350-370 lbs. Towards the end of December, Bebac started falling below the 350 lb. minimum on his range consistently. He visually began to look thinner as well. The team met and decided to add chia seeds as well as a horse nutritional supplement, ProAdd®, to his diet in an effort to try and increase the amount of protein in his diet to help get his body weight back up to his ideal weight range. As of this article, he has made it back within his range and his body condition looks good. We are actively training for voluntary blood draws and voluntary electrocardiograms (ECGs) with both gorillas so that we can even more effectively try and manage the heart disease in both of these individuals.

**Top:** Bebac at a less than ideal body condition during disease progression

**Bottom:** Bebac in 2010 at an ideal (or slightly above range) body condition



Both Dr. Kutinsky and Dr. Hayley Murphy with the Great Ape Heart Project commended the team on picking up this arrhythmia. This was the first time anyone has been able to detect this non-invasively in an awake gorilla with heart disease, without the use of an implantable heart monitor. None of this would have been possible without the training efforts of the team and their focus on voluntary cardiac ultrasound and heart rates. Not only did the training help prevent the potentially dangerous need for anesthesia but it helped the veterinary staff understand Bebac's present heart condition better and allowed for beneficial treatment. These training efforts required a close working relationship between animal care and veterinary staff with time commitment from both ends to the training of the gorillas. The trust and communication that was cultivated during these training sessions was crucial as the team dealt with this event, monitored Bebac and had tough discussions on proper next steps for his management. 

Bebac's most recent body condition back within range after addition of ProAdd®





# The Circle of Love: Keeping the Meerkats at Lincoln Park Zoo Together

## Introduction

Slender-tailed meerkats (*Suricata suricatta*) are diurnal, cooperative, social carnivores native to the Kalahari desert region of southern Africa. Meerkats live in large groups and their social structure consists of a dominant male and female living with an extended family group. Subordinate females are often expelled from the group due to breeding competition (Kutsukake and Clutton-Brock, 2006). Though there have been extensive studies on wild meerkats, there have been few studies of captive meerkats, despite the fact that aggression is a well-established problem in the management of this highly social species (Gossett et al., 2014). The Association of Zoos and Aquariums' (AZA) Mongoose, Meerkat, and

Fossa Care Manual (2011) notes that having enough space is crucial for meerkat social structure and even recommends exhibit spaces that can be divided for separating individuals or groups for temporary periods, or even permanently. We found the recommendation for having dividable spaces to be important in managing the meerkats at Lincoln Park Zoo. Our indoor-only meerkat exhibit consists of a sandy side (see Photo 1) and a gunite side (see Photo 2), which can be combined via tunnels or kept separate. However, this paper describes our efforts to keep our meerkat colony together during a challenging period of aggression.

We have had meerkats at Lincoln Park Zoo since 2003 and dealt with aggression

Photo 1: Sandy side meerkat exhibit at Lincoln Park Zoo's Regenstein African Journey. Photo by Jill Gossett



**Jill Gossett, Lead Keeper**  
**Lincoln Park Zoo, Chicago, IL**  
**and**  
**Katie L. Gillespie,**  
**Conservation Programs Manager**  
**Lincoln Park Zoo, Chicago, IL**



intermittently. Aggression was severe enough at times that one of our males died as a result of aggression-related wounds. With little information available on how to best intervene we also transferred 1.1 meerkats who were expelled from the group to another institution shortly after the death. So in early 2006 when one of our meerkats required medical attention that would mean separating him from the group, we knew it might disrupt their social structure and we wanted to do as much as possible to keep them safe, but also together as a group.

In 2006, our group consisted of 6.4 meerkats with one breeding pair and two groups of four kittens each (see Figure 1). The older group of 2.2 was born 01April04 and the second group of 3.1 was born 17Aug04. Lincoln Park Zoo chose to spay all but the alpha female in an attempt to address aggression before it occurred since little is known about preventing meerkat aggression in captivity.

**Beginning of Aggression**

On 23March06, one of our youngest meerkats, Oliver, stopped eating and began foaming at the mouth. He was taken to the zoo hospital for an examination and radiographs revealed a large obstruction in his stomach. He was taken into surgery and needed to stay overnight at the hospital for recovery. We brought his sister, Olivia, for companionship and also separated the other meerkats in holding to hopefully ease their eventual group reintroduction. Since our meerkat holding suite allows for five separate spaces (see Photo 3), the remaining group members were separated into pairs.



Photo 2: Gunite side meerkat exhibit at Lincoln Park Zoo's Regenstein African Journey. Photo by Jill Gossett.

The following day Oliver and Olivia returned from the hospital and we placed them in the center holding suite. Then we allowed the alpha male (Dallas) and alpha female (Ivy) access to them. We didn't notice any signs of aggression so after approximately one hour, we gave the rest of the group access. At this point we observed substantial amounts of aggression between Dallas and Biko, Jr. and between Pete and Milo. Due to the severity of the aggression, we separated the meerkats into two groups overnight.

The next day we began the reintroduction again by putting all the females with the males that had been the recipients of the most aggression the day before. We added the younger males one by one and did not notice any signs of aggression. We added the alpha male, Dallas, last. We did not see any aggression, although Dallas and Milo remained spatially separated. Given that we did not see any aggression, and since the entire group was back together, we left them all together overnight.

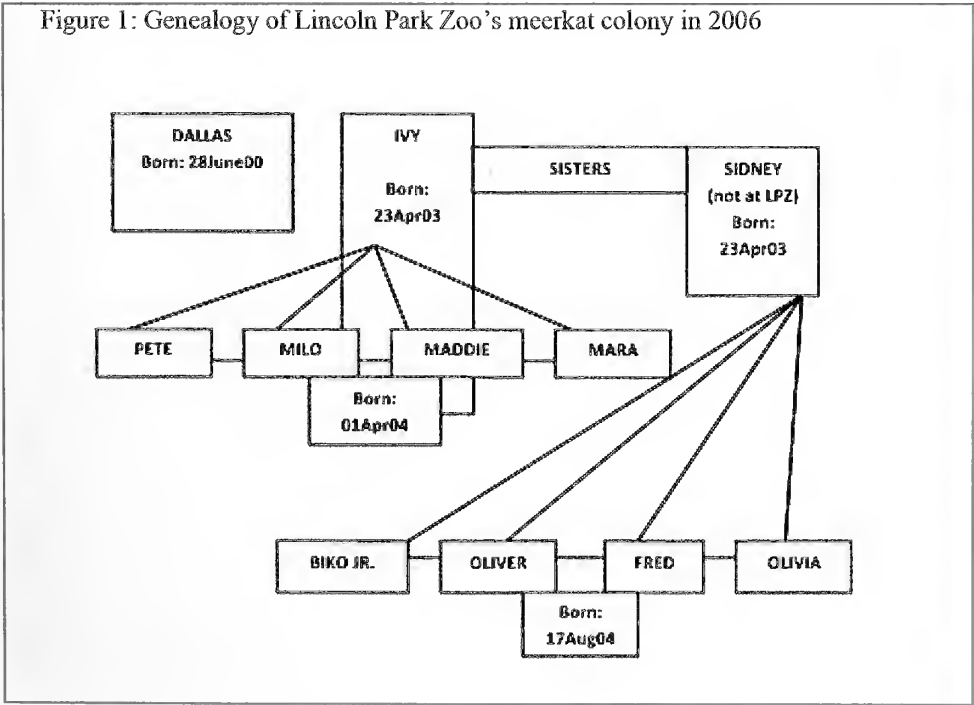


Photo 3: Meerkat holding suite, which can be separated into five individual spaces or combined as needed. Photo by Jill Gossett.





Photo 4: Two meerkats showing aggression towards juvenile male. Photo by Jill Gossett.

### Escalation of Aggression

The next day 28March06, we found Dallas on his back with swollen cheeks and we noticed Milo in the corner protecting Oliver from Biko, Jr. After veterinary evaluation, we took Dallas to the hospital for treatment and separated Milo from the group since we did not want the group to take this as a sign that the alpha male was gone and accept Milo as the new alpha male. Dallas did not require overnight treatment so when he returned back from the hospital we reunited him with the group first, since he was physically compromised, and then added Milo. Several individuals marked on him but he assumed a submissive posture and was left alone. Milo and his brother Pete were still fighting but we left the group together overnight. The morning of 29March06 we found Dallas sleeping with the group but still acting submissive. Some individuals were up and pacing and so we could not determine if they had slept with the group (we monitor if the group sleeps together as an indicator of social stability).

A few days later, Dallas developed an infection around his neck. We found that his appetite decreased over the following week even though we started him on antibiotics and pain killers. By this time we found him sleeping alone most mornings so we considered his social standing in the group gone. The keepers began supplementing him with shank meat and his

health improved, but fighting in the group continued. Biko, Jr. and Oliver began fighting and though Dallas was not being driven out of the group, he was still not accepted either.

We continued treating Dallas and supplemented his food with shank meat, Natural Balance®, bugs, etc. Each morning we cleaned his face and the veterinarians administered fluids and antibiotics. Over the next week, Dallas had even more swelling down his neck and we had serious concerns for him. During this time we noted that the group was sleeping together, but Oliver was isolating himself a lot.

By 07April06, the fighting escalated again and we were concerned that our attempts to keep the group together were failing. Milo was now being isolated by the group both on display and in holding overnight, instigated by Dallas. Milo would climb to a ledge on display out of reach (see Photo 4) and when the group was brought back inside he would immediately climb the mesh of the holding cages and hang. The other meerkats nipped at him, resulting in Milo's tail tip becoming red and dried at the tip. At this point we knew we needed to intervene again.

### The Decision to Intervene

On 12May06 Milo was taken to the zoo hospital where radiographs confirmed a break in the lower tail and we made the decision to

amputate. We used this opportunity to sedate Dallas too so we could check his wounds and take radiographs. With both males separated from the group, we knew reintroductions would be tricky and decided to try a new approach. We spoke with colleagues at another institution who suggested that disrupting scent was important during reintroduction. So we came up with what we affectionately called "the Circle of Love." The Circle of Love consisted of isolating each meerkat in its own crate and then disinfecting the exhibit and holding areas. We sprayed all areas with perfume and then sprayed each meerkat with the same perfume as well. All the meerkats remained isolated for 24 hours facing each other in a circle on exhibit (the only area large enough to accommodate all the crates; see Photo 5).

Under the guidance of our veterinarians, we also started each of the males on a dose of haloperidol. The following morning each male was medicated with haloperidol, the display was loaded with enrichment, and the group was released. Enrichment included fresh cut grass, hay, crickets, worms, baskets, boxes, all kinds of food, spices, etc. We saw submissive behavior from Dallas but no real aggression from anyone in the group. It was as if there had never been any fighting at all! The group spent the day laying together and searching for worms. We continued to scent the display



Photo 5: Meerkat crates positioned for the "Circle of Love". Photo by Jill Gossett.

and holdings with perfume or spices everyday just to be safe.

Though the reintroduction was successful, we were worried that aggression might start back up so we decided to continue the haloperidol. On 27May06 and 28May06, Dallas was seen copulating with Ivy. We continued to record our observations regarding the dynamics of the group the best that we could, but it was difficult to decide if the haloperidol was really responsible for reducing aggression and whether we should continue it. So, our head veterinarian offered the suggestion of a blind study. She provided us with "medication" to give the males but we did not know if it was haloperidol or a placebo. Only the males were medicated and each received 0.2 mg the first week, 0.1 mg the second week and water the remaining weeks for about one month. During this time keepers monitored behaviors and reported anything noteworthy to veterinary staff who then made decisions regarding medication, dosage and duration. Keepers did not note any aggression, although Dallas continued to isolate himself somewhat, but all the meerkats slept together at night and interacted normally. So, in cooperation with veterinary staff, we concluded that we did not need to continue the medication since our aggression was essentially eliminated.

Thankfully our meerkat group has been relatively stable since these incidents. We have used the "Circle of Love" about seven or eight times since to reintroduce various individuals returning from medical procedures and have always had the same success. We continue to use the Circle of Love as our primary tool for reintroducing our meerkats. While our brief experiment with haloperidol seemed to show that it was not necessary for long-term aggression management in our group, we still consider it a tool that could be used as needed for short-term situations should our veterinary staff recommend it.

### Conclusions

When dealing with aggression and reintroduction of our meerkats, the following strategies proved successful for us: 1) separating all individuals into crates while maintaining visual and auditory contact, 2) disrupting scent-marking by thoroughly cleaning the exhibit/holding areas and applying perfume to the exhibit/holding areas and each meerkat, and 3) administering haloperidol to aggressive individuals for a short time-period. These strategies are promising potential management strategies for dealing with meerkat aggression and reintroductions, although further confirmatory research is necessary to determine generalizability. We continue to use the "Circle of Love" method at

Lincoln Park Zoo with great success. In general, we encourage more research on this common management challenge.

### Acknowledgements

We would like to thank the keepers at Asheboro Zoo for their helpful guidance during our reintroduction process. We would also like to thank Dr. Kathryn Gamble and the staff of Regenstien African Journey for their continued work to keep our meerkats together.

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## Injection Training with an Andean Bear (*Tremarctos ornatus*) Pair in Quarantine

By Carolyn Mueller, Carnivore Keeper  
Saint Louis Zoo, St. Louis, Missouri

In August of 2013, the Saint Louis Zoo began demolishing its bear habitats in order to begin construction on the new "Polar Bear Point." The old bear habitats were built in the 1920s and were ready for an upgrade. As part of this process, two Andean bears, Poncho and Maria, moved to the Carnivore holding in the Quarantine area of the zoo for nine months while their new home, "Andean Bear Range," was completed.

Poncho is a 21-year-old male Andean bear and his mate, Maria, is a 24-year-old female. Holding two full-grown Andean bears in a Quarantine area for nine months presented a few challenges. The space consisted of four simple rooms—two indoors and two outdoors—which were furnished with hammocks, pallets, nests and in warmer months, a pool. The bears were enriched several times daily in order to keep them stimulated during this time. As part of this program, Carnivore and Quarantine keepers decided to train the Andean bears at least once a day. The training sessions served to not only help the bears learn important husbandry behaviors, but also to cognitively challenge the bears and give them some one-on-one time with their keepers, helping them cope during this intermittent period between moving from old to new habitats.

One of the main goals of these training sessions was injection training for both bears. Maria has had a history of allergies. Part of her treatment,

prescribed by veterinarians, included taking up to twelve Benadryl a day. As it was very difficult to get Maria to take all of these pills, both keepers and veterinarians thought that perhaps allergy shots might be an option if Maria could be trained for injections.

Also, the bears were anesthetized when moved from their prior habitats to the Quarantine area. We realized that if a large enough crate was not built in time, we might have to anesthetize them again when moving them to their new home. We wanted the bears to allow hand injections, rather than using a dart gun.

Three keepers were involved in the training sessions. A schedule was arranged to allow Quarantine keepers to train Poncho and Maria in the morning, while a Carnivore keeper trained them in the afternoon. The first step of the training process was the attempt to desensitize Poncho and Maria to a stick entering their enclosure through the mesh. It was thought that trainers could use a bamboo rod as a hip and shoulder target to help the bears adjust to being touched at the injection sites. The bears were already target trained with a traditional buoy target. We progressed slowly with the stick target. Our greatest challenge was getting the bears to sit parallel and close to the mesh.

Andean bear "Poncho". Photo by Robin Winkelman.







Andean bear "Maria". Photo by Robin Winkelman.

Part of the solution was to install raised platforms on the walls of their enclosures. Training sessions always began on the platforms. The platforms were narrow rectangles which helped the bears to naturally position themselves in a sitting or lying position next to the mesh of their enclosure. Poncho and Maria each had their own platform. The bears were typically separated prior to the beginning of training sessions to eliminate distraction. The Andeans grew so accustomed to training on these platforms that we often found them waiting for the trainer to arrive, each on her/his own platform, at the usual training time of 1430 hours. The platforms were quite useful, but the bears were still not getting their bodies close enough to the mesh for hand injection.

In October of 2013, animal training team Steve Martin and Dr. Susan Friedman came to the Saint Louis Zoo for a special site visit. These two gurus observed training sessions across the zoo grounds, including the Andean bears. Steve Martin saw how we were attempting to desensitize the Andeans to the hip and shoulder target by touching them with the target and then reinforcing them (typically with grapes). He explained that the bears were not progressing because they were passive participants in the exercise. They were being touched by the stick; they were not choosing to touch the stick themselves. He told us that it would be best for us to empower the bears by training them to press their shoulder or hip into the stick themselves, rather than attempting to desensitize them to it.

This advice proved invaluable in the training process. We did away with the sticks entirely and began to train the bears with a different target. We used slow approximations until both bears learned to press a shoulder (for Poncho) and a hip (for Maria) against the mesh where we positioned this new target. The novel targets encouraged the bears to sit close enough to be hand injected.

We were able to desensitize them to the presence of a syringe and needle. We started the training with a 0.5 mm x 15.8 mm needle. Each bear would go through one practice "poke" with a capped needle before the actual needle was used. The cue used was the word "Poke," followed by the verbal bridge "Good" and then reinforcement such as grapes, raisins or blueberries. Poncho learned to lean into the needle himself,

pricking himself with it rather than having the trainers poke him. This allowed him to become a more active participant in training sessions and to become easily desensitized to the sensation of the "poke." We realized that Maria was actually more comfortable being pricked in the shoulder rather than the hip. Once we transitioned to using her shoulder, she began to lean into the needle as well. Although the bears worked on injection training during both their AM and PM training sessions, only the PM trainer actually "poked" the bears with uncapped needles. The AM trainers simply asked the bears to go through the motion, using a capped syringe.

Shelves were installed to position the bears for hand injections. Photo by Mallory Carmean.







Poncho and Maria on their training shelf. Photo by Mallory Carmean.



Maria in the new Andean Bear Range. Photo by author.

From here, the bears both progressed to a 0.6 mm x 25.4 mm needle, which is the size needed for both allergy shots and anesthetic. We began to practice the injections by injecting the bears with saline solution. Again, only the PM trainer actually injected the saline. Both Poncho and Maria adapted well to this, eventually getting to the point where we only needed to practice injections every other or every few days.


In early March of 2014, Maria's appetite suddenly decreased. She went off of her chow entirely. Since Maria was a 24-year-old bear, the vets became concerned. It was decided that Maria would be anesthetized for an exam. The vets recommended that we attempt to hand inject Maria with a cocktail of Ketamine, Medetomidine and Butorphanol. A few days before the procedure, problems became apparent. Maria was to be anesthetized at 0900 hours. This was a dramatic departure from her usual 1430 hours injection training time. Also, she was not allowed to consume any food, obviously complicating the use of her typical grape reinforcement. A few days before the procedure we attempted to solve these problems by substituting veterinarian approved diluted honey water for her grape reinforcement and by implementing a varied training schedule.

Maria is a very intelligent bear and, unfortunately, on the day of the procedure, she caught on that something was amiss. Maria initially approached for the training session and offered her shoulder. However, during the injection attempt, Maria uncharacteristically pulled away and some of the anesthetic spilled onto the platform. Maria smelled the drug and immediately climbed down off of the platform and moved away from

the trainer. She eventually came back to the mesh and did a few other behaviors but refused to offer her shoulder again. She eventually had to be darted with the anesthetic for her procedure.

We learned a lot from our first attempt to hand inject Maria with an anesthetic drug. Not only do we need to continue to have varied training times with our Andean bears, but we also need to train using honey water occasionally and attempt to desensitize the bears to the scent of whatever drug will be injected well before the day of the procedure. After this attempt, the trainers were able to regroup and begin to work toward these new goals.

In May of 2014, Maria and Poncho moved into their new exhibit, "Andean Bear Range." Fortunately, the bears were both crate trained before the move and so we did not need to anesthetize them during their departure from quarantine. Their new home includes a spacious yard, trickling stream, swimming pool and plenty of trees to climb and lounge in. Happily, they have adjusted well to these novel surroundings. Training sessions with the Andean bears served to help enrich the pair while they spent time living in the Quarantine area, as well as to teach them and their trainers many useful husbandry behaviors which allow us to better care for these animals.

The new challenge of adapting the behaviors learned in Quarantine—including injection training—to the routine of their new home is an ongoing project for the Saint Louis Zoo's Carnivore staff. 

## BHC comments by Jay Pratte:

While reading and editing this paper, I started asking myself questions early on, like "I wonder why they are only training the bears at 2:30 PM?" In my mind, my thought was that the animals are going to anticipate when and where they train, and become less accustomed or willing to train in other places or at other times. However, reading the remainder of the Tale, it became clear that the authors discovered this very issue themselves. The trainers also clearly identified other issues/obstacles and developed ideas on how they could improve the training process accounting for small setbacks. This is the very essence of how to successfully manage a behavior-based training program. When the animal's behavior changes or they exhibit an unexpected response, we as trainers need to adapt and try to understand WHY this occurred, and then plan how to address the concern in future sessions. Remember, the animals only learn from the associations WE teach them. If a step is missing, or we feel we have not communicated something vital to the animal, we need to be able to step back and examine our process, and make some adjustments to see what might work. Great job problem solving and working past obstacles many trainers see in virtually every species we may work with, every day.

On that note, below are a few reminders on some things to watch for during sessions that might help build the associations you are looking for:

- ▶ Vary your training times, and when possible, your training locations. If you always train your animal at 10 am in holding room 2, then the animal is going to learn those are part of the training parameters, and be confused or reluctant to exhibit the behavior at other times/ places. You want to know that the animal responds properly to the CUE, not the surroundings.
- ▶ Vary your rewards. If you suddenly run out of your primary reward, it spoils, etc, you do not want to be caught unable to properly reinforce requested behaviors. As well, animals' preferences may shift over time and reinforcers can change in value. By changing them up, you can keep the animals interested, wondering what exciting reward they're going to get ("ugh, peanuts again?"), and provide yourself with more options for any given session.
- ▶ Desensitization and counter-conditioning address how we build associations with animals in regard to things that might actually be aversive stimuli (i.e.- a new target, syringes, x-ray equipment, vet personnel...). By thinking ahead, we can identify possible aversive stimuli, work to pair them slowly with food to reduce reactivity, and build reinforcing associations.
- ▶ Try to have one person be responsible for training a new behavior. This way, the animal learns consistently and doesn't have to figure out different styles or methods among several trainers. Once the behavior is considered "maintenance", then it can be turned over to other staff to practice with the animal. Animals can learn different new behaviors concurrently, but if this is the case teach one new behavior in one session, and then a different behavior in a separate session to help avoid confusing the animal.

Again, thank you for the submission to Training Tales! We enjoy reading about your work and helping share it with the keeper community.

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Submit a brief description of a training project at your facility. These can be 500 words or less, in text or bullet points – It can be longer (up to 1000 words); however, short and simple descriptions with a few images are just as perfect. Details should include the following:

- ▶ Define the training goal (what did you try to do and for what purpose?)
- ▶ List important steps (How did you do it – include plans that changed along the way/what worked & what didn't work)
- ▶ Timeline used (how long did it take)
- ▶ Tips you learned along the way
- ▶ Include 3-5 digital photos that clearly depict the animal in the learning process or performing the desired goal (provide photo caption and photographer of each image). Photos need to be 300 dpi and at least 1200 x 1800 pixels.

Please send entries or questions to:

Kim Kezer at [kkezer@zoonewengland.com](mailto:kkezer@zoonewengland.com) or

Shane Good at [shane.good@azk.org](mailto:shane.good@azk.org)

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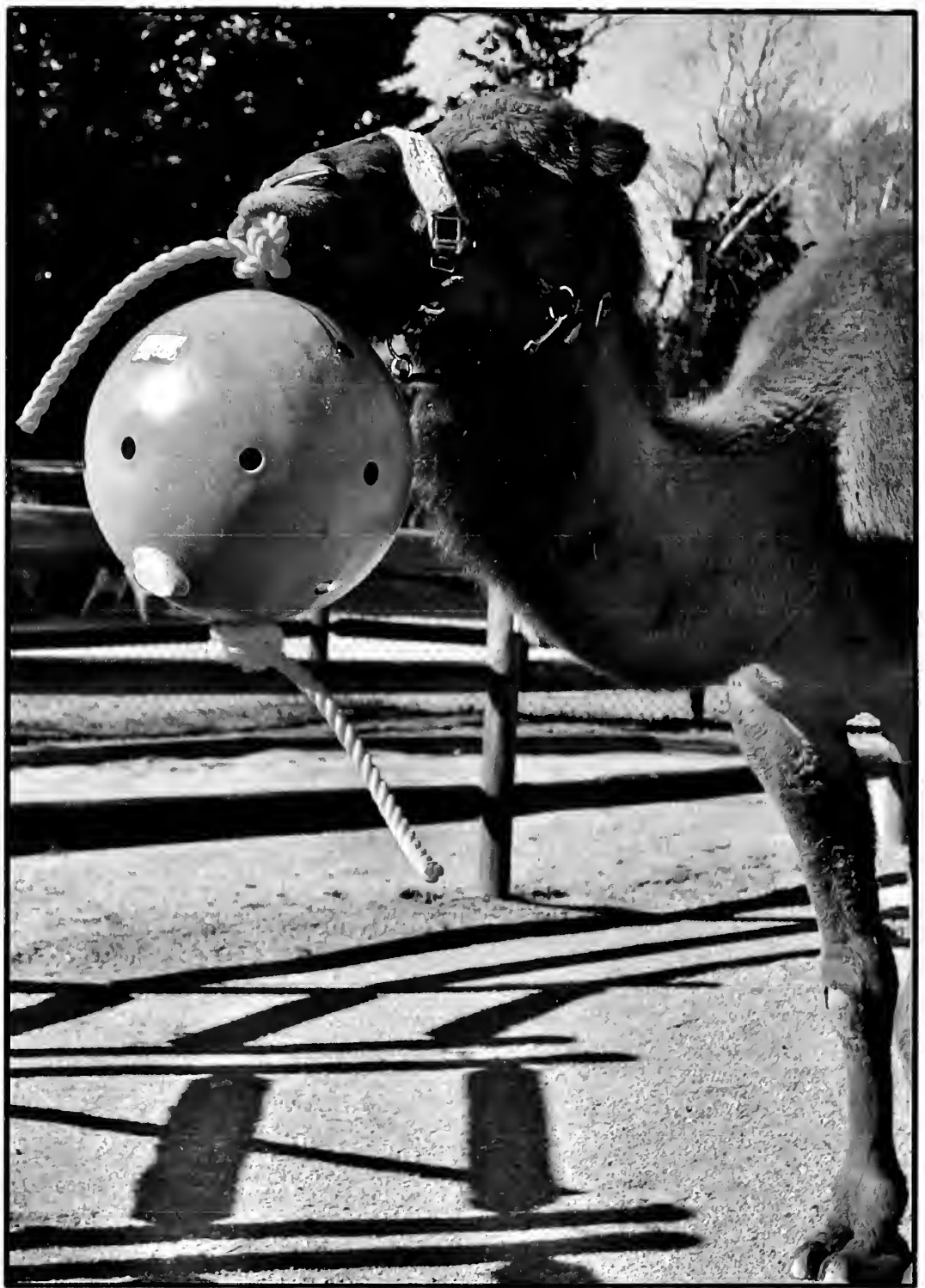


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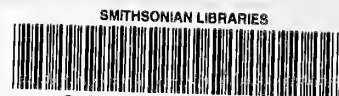
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